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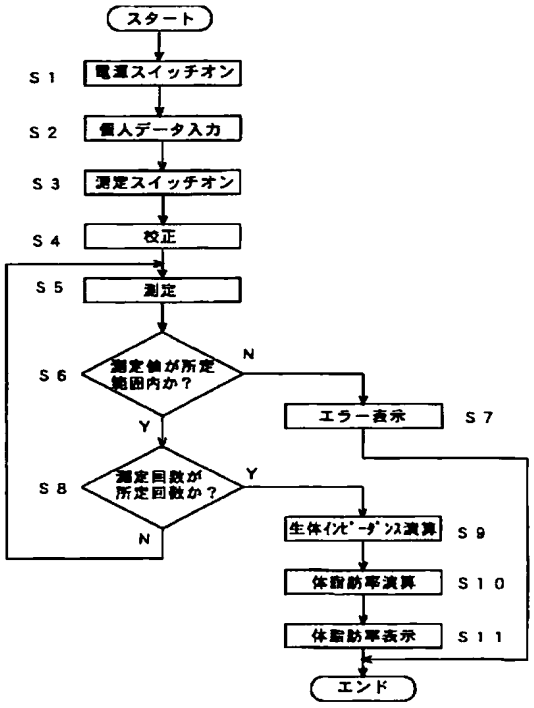
(54)【発明の名称】　生体インピーダンス測定装置

(57)【要約】
【課題】　被験者がディレイ時間内に測定姿勢になった場合でも、そのタイミングが測定開始直前の場合は、測定開始直後のインピーダンスの値が正確ではない場合がある。
【解決手段】　インピーダンス測定手段が測定した最初の所定回数分のインピーダンスの値を除いて生体のインピーダンスを演算するようにした。



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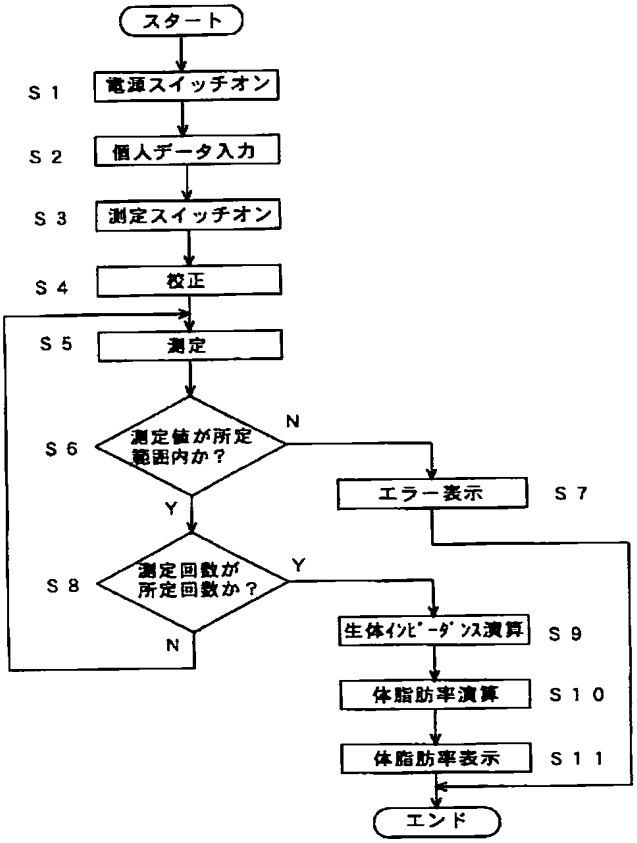

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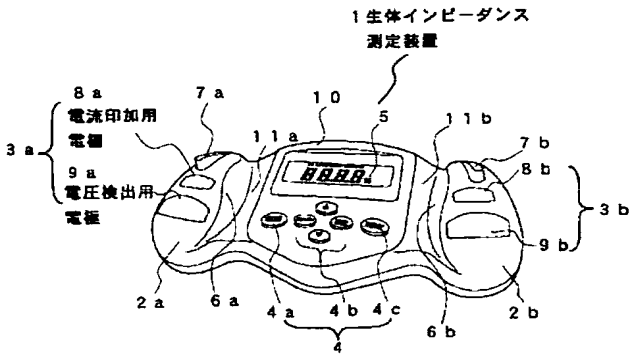

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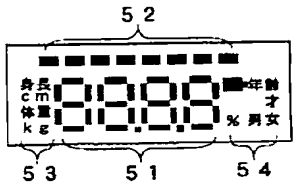

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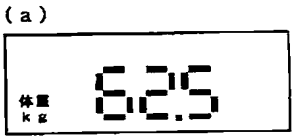

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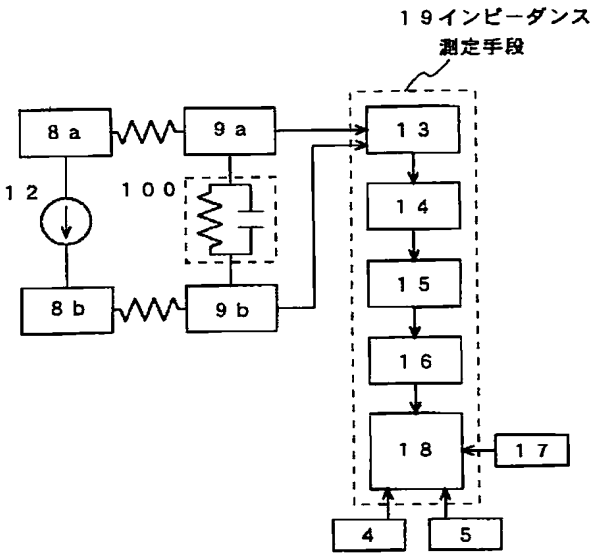

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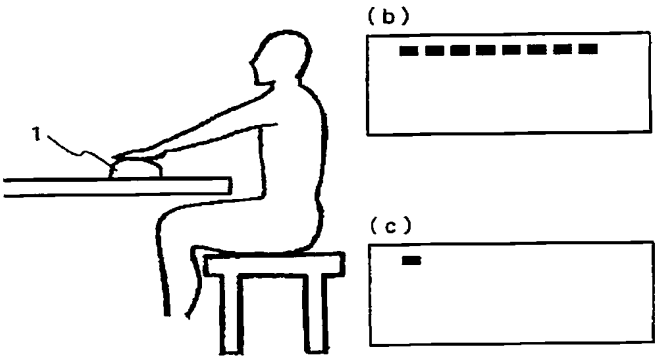

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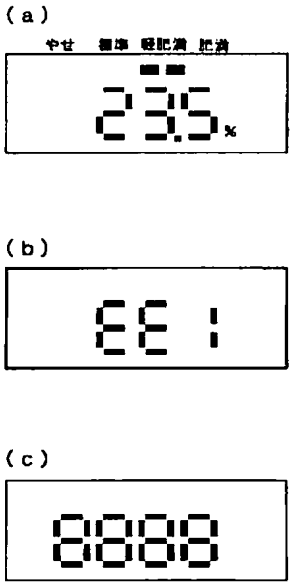

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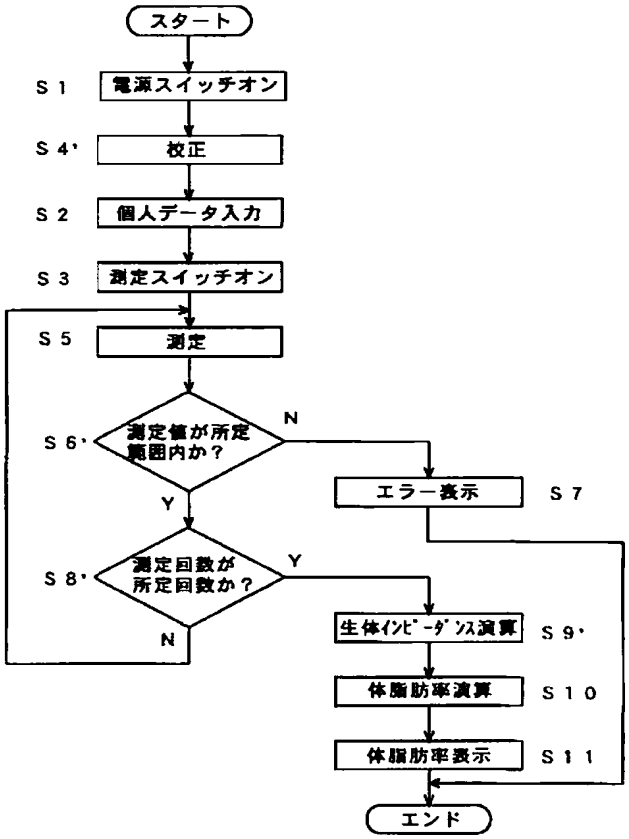

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EE08 FF01 FF05 GG00 GG13
GG16 HH11 KK01 KK03

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the body impedance measuring device which measures a living body's impedance.
[0002]
[Description of the Prior Art]The body impedance measuring device which measures a living body's impedance and calculates predetermined biological information, such as a body fat percentage, conventionally is proposed. For example, the art is indicated by JP,8-154910,A.
[0003]The body impedance measuring device currently indicated by the gazette, As shown in drawing 1 and drawing 2 of the gazette, the electrode of a grip part on either side is grasped with the both hands which are predetermined measured regions, and a test subject extends both hands ahead [straight] with a standing position posture, levels, stops a body part to a height of shoulder, and measures body fat.
[0004]And if a start switch is pushed, after setting the delay time for several seconds, it is constituted so that measurement of impedance may be started, and a test subject becomes the above-mentioned measurement posture between this delay time.
[0005]
[Problem(s) to be Solved by the Invention]However, when a test subject becomes a measurement posture in delay time and the timing is just before a measurement start, the value of the impedance immediately after a measurement start may not be exact. Generally, the body impedance measuring device makes voltage detected from the electrode the **** smoothness for integration smoothing circuits so that a test subject's delicate body motion may not influence measured value. Therefore, it may be in the transient state before reaching a stationary state immediately after touching an electrode with a hand, and its value of the impedance immediately after a measurement start may not be [the output of an integration

smoothing circuit] exact.

[0006]this invention is made in view of the above-mentioned conventional technical problem, and comes out. The purpose is for body impedance to provide body impedance measuring devices, such as a measurable body-fat scale, correctly.

[0007]

[Means for Solving the Problem]To achieve the above objects, a body impedance measuring device in this invention, An impedance measurement means which carries out multiple-times measurement of the value of impedance an electrode of a couple and inter-electrode [of this couple] for contacting a test subject's predetermined part continuously, [at least] In a body impedance measuring device provided with a calculating means which calculates a living body's impedance based on measured value of this impedance measurement means, and a control means for making measuring operation of said impedance measurement means start, Said calculating means calculates said living body's impedance except for a value of impedance for the first prescribed frequency that an impedance measurement means measured.

[0008]For contacting a test subject's predetermined part, at least An electrode of a couple, An impedance measurement means which carries out multiple-times measurement of the value of inter-electrode impedance of this couple continuously, In a body impedance measuring device provided with a calculating means which calculates a living body's impedance based on measured value of this impedance measurement means, and a control means for making measuring operation of said impedance measurement means start, Said calculating means calculates said living body's impedance except for measured value which said impedance measurement means measured after operating said control means before carrying out specified time elapse.

[0009]Time after operating said control means until said impedance measurement means starts measuring operation was set up more than time when a test subject is able to contact a predetermined part to said electrode.

[0010]A detection means to detect whether a value of impedance which said impedance measurement means measured is contained in a predetermined range is formed, When this detection means detects measured value which is not contained in a predetermined range from a value of impedance removed from an operation of said body impedance at least, measuring operation of impedance is stopped.

[0011]Before measurement of impedance used for an operation of said body impedance after said impedance measurement means' starting measuring operation is started, it has an informing means which performs predetermined information.

[0012]Said body impedance measuring means calculates a living body's body fat percentage

using a value of a living body's impedance which said calculating means calculated.
[0013]
[Embodiment of the Invention]Hereafter, based on a drawing, the body impedance measuring device in this invention is explained. With respect to an embodiment of the invention, drawing 1 - drawing 7 drawing 1, The flow chart and drawing 2 in which the measuring operation of a body impedance measuring device is shown The appearance perspective view of a body impedance measuring device, The figure in which drawing 3 showed the block diagram of the body impedance measuring device, and drawing 4 showed the measurement posture at the time of measurement of a body impedance measuring device, the figure in which drawing 5 showed the display pattern of the indicator of a body impedance measuring device, drawing 6, and drawing 7 are the display examples of a body impedance measuring device.
[0014]First, the composition of each part of a body impedance measuring device is explained using drawing 2. The placing part 2a of the couple which 1 is a body impedance measuring device, and sees from the transverse plane of the device 1 and lays the hand of a test subject's right and left in both sides, It has 2b, and the electrode 3a for left hands and the electrode 3b for right hands are formed in the placing part 2a of this couple, and 2b so that the predetermined part of the hand a test subject's right and left may be contacted. The body part 10 which has the indicator 5 which displays predetermined information, including the electric power switch 4a, the input switch 4b which inputs personal data, the measuring switch 4c which starts measurement, input data, a body fat percentage, etc., in the approximately middle of said placing part 2a and 2b is arranged.
[0015]While forming the lateral portions 6a (for left hands), and 6b (for right hands) of the couple which can be held with a test subject's thumb, digitus minimus or the thumb, and the third finger in the placing part 2a of a couple, and each of 2b, The locatings lug 7a and 7b which position the direction which goes to a fingertip from the placing part 2a of a couple and the wrist of the hand laid in 2b are formed.
[0016]These locatings lug 7a and 7b can be inserted between the index finger, the middle finger or the middle finger, and the third finger, and the direction which goes to a fingertip from the wrist of a hand can be positioned by making the projections 7a and 7b contact between the roots of these two fingers.
[0017]The placing part 2a of a couple and 2b are formed in what is called mouse shape, the surface is curvature shape or a convex curved surface, and an electrode fits the hollow of a palm, and it makes contact of the palm of an electrode and a hand easy.
[0018]The electrode 3a for left hands and the electrode 3b for right hands which are allocated by the placing part 2a of a couple and 2b have the electrodes 8a and 8b for current impression which impress current to a test subject's hand, and the electrodes 9a and 9b for voltage detection which detect voltage from a test subject's hand, and all are an approximately

rectangle or approximately ellipse type.

[0019]Between the placing part 2a of a couple, and 2b and the body part 10, the crevices 11a and 11b formed so that the thumb might be settled are formed.

[0020]Next, the method of a measuring method of the impedance by the body impedance measuring device 1 is explained using drawing 2. First, a test subject pushes the electric power switch 4a, switches on a power supply, and inputs personal data, such as height, weight, and age, with the input switch 4b. And after pushing the measuring switch 4c, where the body impedance measuring device 1 is put on a flat surface within 4.5 seconds, a hand is laid in said placing part 2a and 2b so that a palm and a flat surface may counter. If impedance is measured, a body fat percentage will calculate based on the value of this measured body impedance, and that result will be displayed on the indicator 5.

[0021]Drawing 4 shows a measurement posture and a test subject measures in the state where the flat surface on which the wrist on either side put said body impedance measuring device 1 is not contacted after sitting on the chair, straightening the back, lengthening both hands ahead and the hand on either side having been positioned by the placing part 2a of a couple, and 2b.

[0022]Next, the block diagram of the body impedance measuring device 1 is explained using drawing 3. In drawing 3, the body impedance measuring device comprises the high frequency signal generating part 12, the electrodes 8a and 8b for current impression, the electrodes 9a and 9b for voltage detection, the impedance measurement means 19, the operation switch 4, the indicator 5, and ROM17.

[0023]High frequency ******** 12 is a sine wave (about 10 kHz - 100 kHz), generates the constant current high frequency signal of hundreds of microA, and impresses it to the electrodes 8a and 8b for current impression. The impedance measurement means 19 calculates a living body's body fat percentage based on the measured body impedance while measuring the electrode 9a for voltage detection, and the body impedance 100 between 9b based on the potential difference signal from the electrodes 9a and 9b for voltage detection. ROM17 has memorized the operation data etc. which CPU18 uses for the operation of a body fat percentage.

[0024]The operation switch 4 consists of the electric power switch 4a, the input switch 4b, and the measuring switch 4c, as shown in drawing 2, and these are connected to CPU18 which is a component of the impedance measurement means 19. The indicator 5 performs a display action based on the status signal from CPU18.

[0025]The differential amplifier 13 with which the impedance measurement means 19 receives the potential difference signal from the electrodes 9a and 9b for voltage detection, The full wave rectifier 14 and the integration smoothing circuit 15 for carrying out absolute value processing of the sine wave signal from the differential amplifier 13, and making it the absolute

value signal which is an analog signal, While incorporating the data of the height from the input and the operation switch 4 from A/D converter 16 which changes an analog signal into a digital signal, and A/D converter 16, weight, age, sex, etc. and calculating body impedance, It comprises CPU18 which calculates the living body's 100 body fat percentage based on the calculated body impedance.

[0026]At this embodiment, if measurement is started, the impedance between the electrode 9a for voltage detection and 9b will be measured 24 times with a predetermined cycle, but the first six batches remove CPU18, it calculates body impedance using the measured value of the 18 remaining batches, and is calculating the body fat percentage based on this.

[0027]CPU18 judges whether each impedance value measured 24 times is unusual. for example, -- if the value of impedance judges whether it is for 200 to 1100 ohms which is a predetermined range and is contained within the limits of this -- normal values -- if not contained, a judgment law is carried out to an abnormal value.

[0028]Next, the display pattern of the indicator 5 is explained using drawing 5. The indicator 5 has the numeric display 51, the graphical representation part 52, and the mark indicating parts 53 and 54. The numeric display 51 comprises four 7 segment display patterns and two decimal point display patterns, and displays the data of test subjects, such as height, weight, and age, the calculated body fat percentage, etc. numerically. The graphical representation part 52 arranges eight dot display patterns to linear shape, is constituted, when it makes it turn on one dot display pattern at a time or displays a body fat percentage during measurement, makes two adjacent dot display patterns turn on, and carries out graphical representation of the corpulence degree. When they display a data type and its unit when the mark indicating parts 53 and 54 input a test subject's data, or they display a body fat percentage, they display "%" which is a unit of a body fat percentage, or display the cell mark the cell voltage which is a power supply indicates it to be to a fall case.

[0029]Next, the measuring operation by the body impedance measuring device of this invention is explained using drawing 1, drawing 3, drawing 6, and drawing 7. S1 to S12 of drawing 1 shows each step of the measuring process.

[0030]First, by S1, if a test subject pushes the electric power switch 4a, CPU18 which detected it will perform processing which turns ON the power supply of the body impedance measuring device 1. Next, a test subject inputs the above-mentioned personal data using the input switch 4b by S2. CPU18 memorizes the personal data inputted according to operation of the input switch 4b. The display example of the indicator 5 at the time of inputting the weight of 62.5 kg is shown in drawing 6 (a).

[0031]Next, a test subject pushes the measuring switch 4c by S3. Then, CPU18 which detected this performs proofreading operation for 4.5 seconds by S4. This proofreading operation is performed in order to proofread the error of the measurement result by

temperature characteristics and the voltage characteristic of a measuring circuit. If the accuracy of measurement of a body fat percentage is taken into consideration, this proofreading operation is required about several seconds at least.

[0032]For example, the impedance measurement means 19 is constituted so that a grand level and resistance may switch to known reference resistance and it can connect from the electrodes 9a and 9b for voltage detection by the switch circuit which is not illustrated. And the voltage at the time of connecting a grand level and reference resistance is measured, and the voltage-impedance conversion coefficient is calculated.

[0033]Next, in S5, measurement of body impedance is started following proofreading operation. Measurement of body impedance is measured a total of 24 times a 300msec cycle, and it makes this body impedance in quest of the average value of the measured value of the 18 remaining batches except for the measured value of the impedance of the first six batches so that it may mention later.

[0034]Time after pushing the measuring switch 4c by S3 until measurement is started by S5 is 4.5 seconds, as the display of the indicator 5 is shown in drawing 6 (b), a blink indication only of the bar indicator 52 is given, and others are in a putting-out-lights state. A test subject lays the placing part 2a in 4.5 seconds after pushing the measuring switch 4c by S3 until measuring operation is started, lays a hand in 2b, becomes a measurement posture, and he maintains a posture so that it may not move.

[0035]In S6, the value of the body impedance which CPU18 measured carries out [whether it is within the limits of not less than 200ohms 1100ohms or less which is a prescribed range, and] decision processing. That is, it is judged whether there is any value of the measured impedance within limits detected when the palm touches the current impression electrodes 8a and 8b and the electrodes 9a and 9b for voltage detection. CPU18 judges with the hand not touching each electrode, when the measured value which is not within the limits of this is detected from the value of the measured body impedance.

[0036]And when it is in said within the limits, CPU18 judges that he has no abnormalities S7, processes S8, when there is nothing to said within the limits, judges it as those with abnormalities by S7, and processes S7.

[0037]In S7, an error display as shown in drawing 7 (b) is carried out, and measurement is ended. An error display is displayed as "EE1" by the numeric display 51 of the indicator 5. That is, CPU18 is operating as a measuring operation control means which stops the measuring operation of impedance, when the measured value which is not contained in the predetermined range is detected, after measurement of said impedance is started.

[0038]In S8, CPU18 judges whether the measurement count amounted to 24 times which is prescribed frequency. If it judges that it does not amount to 24 times in S8, it will return to the measuring process of S5, and S10 will be processed if it judges that it amounted to 24 times.

While having repeated the measuring operation of S5 to S8, if one lights up at a time from the dot at the left end of the graphical representation part 52 and the light is switched on to a right end dot with a predetermined cycle, the display action which it turns on one [at a time] from a left end dot again will be repeated. Drawing 6 (c) shows the state where the dot at the left end of the graphical representation part 52 lit up. By S9, among the impedance of 24 batches which CPU18 measured, the first six batches remove, calculate the average value of the impedance of the 18 remaining batches, and make this body impedance.

[0039]Since measuring periods are 300msec, time to measure the impedance of the first six batches is about 1.8 seconds. Even when a test subject becomes a measurement posture just before measurement is started by S5, since the damping time constant is set up be in a stationary state in these 1.8 seconds, the integration smoothing circuit 15 can calculate more exact body impedance.

[0040]CPU18 calculates a test subject's body fat percentage with a predetermined computing equation using the personal data inputted as the body impedance calculated by S9 by S2 by S10. CPU18 displays the body fat percentage for which it asked S10 on the indicator 5 by S11. A body fat percentage carries out graphical representation of the rule of thumb of a corpulence degree in the graphical representation part 52 while displaying it as "23.5%" in the numeric display 51 and the mark indicating part 54, as shown in drawing 7 (a), for example. The character of "becoming thin", a "standard", the "technically overweight", and "obesity" which show a corpulence degree is printed by the upper part of the graphical representation part 52, and it is made to turn on two dots of the graphical representation part 52 under the character which shows the corpulence degree applicable to the calculated body fat percentage, as shown in drawing 7 (a).

[0041]In the flow chart shown in drawing 1, while [4.5 seconds] requiring for the proofreading operation performed by S4 after pushing the measuring switch 4c by S3, he is trying for a test subject to contact a hand to the electrode 3a for left hands, and the electrode 3b for right hands, but he may set this time as 4.5 seconds or more. For example, the waiting time for about 2 seconds may be established between proofreading operation of S4, and the measuring operation of S5, and time may be set up so that a test subject can contact a hand to each electrode with a margin. Time after pushing the measuring switch 4c by S3 until measurement is started by S5 should just be set up more than the time which can contact a test subject's hand to the electrode 3a for left hands, and the electrode 3b for right hands, after a test subject pushes the measuring switch 4c.

[0042]After the 1st impedance measurement is started by S5 until the 6th impedance measurement is completed, Namely, after an impedance measurement means starts measuring operation, before measurement of the impedance used for the operation of body impedance is started, as shown, for example in drawing 7 (c), "8888" is displayed by the

numeric display 51, It may be made to report that measurement used for the operation of body impedance is performed to an operating personnel.

[0043]It detects whether the value of impedance is unusual at S6, and can avoid displaying an inaccurate body fat percentage to a test subject by stopping measurement, in being unusual. Before measurement of the impedance used for the operation of body impedance by judging whether the measured value of the impedance of the first six batches that are not used in particular for the operation of body impedance is unusual starts, it can report to a test subject that a measurement posture is not right.

[0044]Although it has decided by the measurement count whether use for the operation of body impedance among the measured value of impedance in the embodiment shown in drawing 1, it may be made to decide this invention not only by this but by measuring time.

[0045]for example, it may be made to calculate a living body's impedance except for the measured value which the impedance measurement means measured after pushing the measuring switch 4c by S3 of drawing 1 (or -- since measuring operation is started) before carrying out specified time elapse If it explains concretely, after pushing the measuring switch 4c, measurement of impedance will be first started after 4.5 second passage. Measurement of impedance is measured 24 times with the cycle of 300msec after these 4.5 seconds, and total measuring time is 12 seconds.

[0046]CPU18 measures the time after the measuring switch 4c is pushed by S3. And the measured value which is predetermined time and which was measured by the time it carried out 7 second passage calculates the average value of the measured value measured after carrying out 7 second passage, without using for the operation of body impedance, and makes this body impedance.

[0047]Thus, what is necessary is just made to perform the same processing as drawing 1 except deciding whether use for the operation of body impedance by measuring time. For example, as S7 of drawing 1 explained, when the measured value which is not contained in the predetermined range is detected from the measured value of impedance, the measuring operation of impedance is stopped. It is preferred to set up a test subject's predetermined part more than the time when it is possible to make said electrode contact, and time after operating an operation switch until measurement of impedance is started, Before the measured value used for the operation of body impedance is measured, it may be made to perform predetermined information.

[0048]In the embodiment shown in drawing 1, after the test subject pushed the measuring switch 4c by S3, S4 performed proofreading operation, but this proofreading operation may not necessarily be after pushing the measuring switch 4c. Next, the modification which performs proofreading operation to other timing using drawing 8 is explained.

[0049]drawing 8 -- body impedance -- a measuring device -- a modification -- measuring

operation -- being shown -- a flow chart -- it is -- drawing 1 -- differing -- a thing -- proofreading -- processing -- S4 -- ' -- carrying out -- having -- timing -- unusual -- a judging process -- S -- six -- ' -- a measurement count -- a judging process -- S -- eight -- ' -- body impedance -- an operation -- S9 -- ' -- processing -- contents -- it is . Only different processing from drawing 1 is explained and explanation of other processings is omitted.

[0050]First, proofreading operation (S4') is performed in this modification by the next processing in which the test subject pushed the electric power switch 4a by S1. The contents of the proofreading operation by S4' are the same as S4 of drawing 1. In the unusual judging process of S6', the impedance measurement value of the first 15 batches does not judge that it is an abnormal value, and only the impedance measurement value of the 24 remaining batches judges that it is an abnormal value. The impedance measurement time of the first 15 batches is 4.5 seconds, and a test subject lays the placing part 2a in these 4.5 seconds, it lays a hand in 2b, and it becomes a measurement posture.

[0051]In S8', a measurement count judges that it is 39 times which is prescribed frequency, if a measurement count is 39 times, it will progress to S9', and if it is not 39 times, it will return to processing of S5. In S9', among the measured value of 39 batches, the first 21 batches remove, calculate the average value of the value of the impedance of the 18 remaining batches, and make this body impedance.

[0052]In this modification, measurement of impedance is started immediately after operating the measuring switch 4c. However, since measuring periods are 300msec, the time when measurement of the impedance of the first 21 batches removed from the operation of body impedance is performed is 6.3 seconds, For 4.5 seconds of the beginning, it is the time when an operating personnel becomes a measurement posture, and since for the remaining 1.8 seconds comes out time until the integration smoothing circuit 15 will be in a stationary state, the operation of body impedance also with an exact case of this modification is possible for it.

[0053]Thus, while making the measuring operation of the impedance measurement means 19 start immediately after operating the measuring switch 4c, Time for the impedance measurement means 19 to measure the value of the impedance removed from the operation of a living body's impedance (in other words.) Time until measurement of the value of the impedance used for the operation of body impedance after the impedance measurement means 19 starts measuring operation is started, After a test subject operates the measuring switch 4c, the hand which is a predetermined part may be set up more than the time when it is possible to make the electrodes 3a and 3b contact.

[0054]Although the above is explanation of a modification, as long as the timing of proofreading operation is before measurement of not only the timing shown in drawing 1 or drawing 8 but body impedance, it may be performed to any timing. For example, it may carry out between S2 and S3 of drawing 8, and between S8' and S9'.

[0055]It is not necessary to make measurement of body impedance start immediately after pushing the measuring switch 4c also in the case of the modification of drawing 8. For example, body impedance may be measured, after pushing the measuring switch 4c and waiting for the stability of the circuit of operation amplifier 13 grade for 1 to 2 seconds.
[0056]
[Effect of the Invention]By the above explanation, the body impedance measuring device of this invention has an effect which can measure body impedance more correctly so that clearly.

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TECHNICAL FIELD

[Field of the Invention]This invention relates to the body impedance measuring device which measures a living body's impedance.

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PRIOR ART

[Description of the Prior Art]The body impedance measuring device which measures a living body's impedance and calculates predetermined biological information, such as a body fat percentage, conventionally is proposed. For example, the art is indicated by JP,8-154910,A.
[0003]The body impedance measuring device currently indicated by the gazette, As shown in drawing 1 and drawing 2 of the gazette, the electrode of a grip part on either side is grasped with the both hands which are predetermined measured regions, and a test subject extends both hands ahead [straight] with a standing position posture, levels, stops a body part to a height of shoulder, and measures body fat.
[0004]And if a start switch is pushed, after setting the delay time for several seconds, it is constituted so that measurement of impedance may be started, and a test subject becomes the above-mentioned measurement posture between this delay time.

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EFFECT OF THE INVENTION

[Effect of the Invention]By the above explanation, the body impedance measuring device of this invention has an effect which can measure body impedance more correctly so that clearly.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]However, when a test subject becomes a measurement posture in delay time and the timing is just before a measurement start, the value of the impedance immediately after a measurement start may not be exact. Generally, the body impedance measuring device makes voltage detected from the electrode the **** smoothness for integration smoothing circuits so that a test subject's delicate body motion may not influence measured value. Therefore, it may be in the transient state before reaching a stationary state immediately after touching an electrode with a hand, and its value of the impedance immediately after a measurement start may not be [the output of an integration smoothing circuit] exact.
[0006]this invention is made in view of the above-mentioned conventional technical problem, and comes out. The purpose is for body impedance to provide body impedance measuring devices, such as a measurable body-fat scale, correctly.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

MEANS

[Means for Solving the Problem]To achieve the above objects, a body impedance measuring device in this invention, An impedance measurement means which carries out multiple-times measurement of the value of impedance an electrode of a couple and inter-electrode [of this couple] for contacting a test subject's predetermined part continuously, [at least] In a body impedance measuring device provided with a calculating means which calculates a living body's impedance based on measured value of this impedance measurement means, and a control means for making measuring operation of said impedance measurement means start, Said calculating means calculates said living body's impedance except for a value of impedance for the first prescribed frequency that an impedance measurement means measured.

[0008]For contacting a test subject's predetermined part, at least An electrode of a couple, An impedance measurement means which carries out multiple-times measurement of the value of inter-electrode impedance of this couple continuously, In a body impedance measuring device provided with a calculating means which calculates a living body's impedance based on measured value of this impedance measurement means, and a control means for making measuring operation of said impedance measurement means start, Said calculating means calculates said living body's impedance except for measured value which said impedance measurement means measured after operating said control means before carrying out specified time elapse.

[0009]Time after operating said control means until said impedance measurement means starts measuring operation was set up more than time when a test subject is able to contact a predetermined part to said electrode.

[0010]A detection means to detect whether a value of impedance which said impedance measurement means measured is contained in a predetermined range is formed, When this detection means detects measured value which is not contained in a predetermined range

from a value of impedance removed from an operation of said body impedance at least, measuring operation of impedance is stopped.

[0011]Before measurement of impedance used for an operation of said body impedance after said impedance measurement means' starting measuring operation is started, it has an informing means which performs predetermined information.

[0012]Said body impedance measuring means calculates a living body's body fat percentage using a value of a living body's impedance which said calculating means calculated.

[0013]

[Embodiment of the Invention]Hereafter, based on a drawing, the body impedance measuring device in this invention is explained. With respect to an embodiment of the invention, drawing 1 - drawing 7 drawing 1, The flow chart and drawing 2 in which the measuring operation of a body impedance measuring device is shown The appearance perspective view of a body impedance measuring device, The figure in which drawing 3 showed the block diagram of the body impedance measuring device, and drawing 4 showed the measurement posture at the time of measurement of a body impedance measuring device, the figure in which drawing 5 showed the display pattern of the indicator of a body impedance measuring device, drawing 6, and drawing 7 are the display examples of a body impedance measuring device.

[0014]First, the composition of each part of a body impedance measuring device is explained using drawing 2. The placing part 2a of the couple which 1 is a body impedance measuring device, and sees from the transverse plane of the device 1 and lays the hand of a test subject's right and left in both sides, It has 2b, and the electrode 3a for left hands and the electrode 3b for right hands are formed in the placing part 2a of this couple, and 2b so that the predetermined part of the hand a test subject's right and left may be contacted. The body part 10 which has the indicator 5 which displays predetermined information, including the electric power switch 4a, the input switch 4b which inputs personal data, the measuring switch 4c which starts measurement, input data, a body fat percentage, etc., in the approximately middle of said placing part 2a and 2b is arranged.

[0015]While forming the lateral portions 6a (for left hands), and 6b (for right hands) of the couple which can be held with a test subject's thumb, digitus minimus or the thumb, and the third finger in the placing part 2a of a couple, and each of 2b, The locatings lug 7a and 7b which position the direction which goes to a fingertip from the placing part 2a of a couple and the wrist of the hand laid in 2b are formed.

[0016]These locatings lug 7a and 7b can be inserted between the index finger, the middle finger or the middle finger, and the third finger, and the direction which goes to a fingertip from the wrist of a hand can be positioned by making the projections 7a and 7b contact between the roots of these two fingers.

[0017]The placing part 2a of a couple and 2b are formed in what is called mouse shape, the

surface is curvature shape or a convex curved surface, and an electrode fits the hollow of a palm, and it makes contact of the palm of an electrode and a hand easy.

[0018]The electrode 3a for left hands and the electrode 3b for right hands which are allocated by the placing part 2a of a couple and 2b have the electrodes 8a and 8b for current impression which impress current to a test subject's hand, and the electrodes 9a and 9b for voltage detection which detect voltage from a test subject's hand, and all are an approximately rectangle or approximately ellipse type.

[0019]Between the placing part 2a of a couple, and 2b and the body part 10, the crevices 11a and 11b formed so that the thumb might be settled are formed.

[0020]Next, the method of a measuring method of the impedance by the body impedance measuring device 1 is explained using drawing 2. First, a test subject pushes the electric power switch 4a, switches on a power supply, and inputs personal data, such as height, weight, and age, with the input switch 4b. And after pushing the measuring switch 4c, where the body impedance measuring device 1 is put on a flat surface within 4.5 seconds, a hand is laid in said placing part 2a and 2b so that a palm and a flat surface may counter. If impedance is measured, a body fat percentage will calculate based on the value of this measured body impedance, and that result will be displayed on the indicator 5.

[0021]Drawing 4 shows a measurement posture and a test subject measures in the state where the flat surface on which the wrist on either side put said body impedance measuring device 1 is not contacted after sitting on the chair, straightening the back, lengthening both hands ahead and the hand on either side having been positioned by the placing part 2a of a couple, and 2b.

[0022]Next, the block diagram of the body impedance measuring device 1 is explained using drawing 3. In drawing 3, the body impedance measuring device comprises the high frequency signal generating part 12, the electrodes 8a and 8b for current impression, the electrodes 9a and 9b for voltage detection, the impedance measurement means 19, the operation switch 4, the indicator 5, and ROM17.

[0023]High frequency ******** 12 is a sine wave (about 10 kHz - 100 kHz), generates the constant current high frequency signal of hundreds of microA, and impresses it to the electrodes 8a and 8b for current impression. The impedance measurement means 19 calculates a living body's body fat percentage based on the measured body impedance while measuring the electrode 9a for voltage detection, and the body impedance 100 between 9b based on the potential difference signal from the electrodes 9a and 9b for voltage detection. ROM17 has memorized the operation data etc. which CPU18 uses for the operation of a body fat percentage.

[0024]The operation switch 4 consists of the electric power switch 4a, the input switch 4b, and the measuring switch 4c, as shown in drawing 2, and these are connected to CPU18 which is

a component of the impedance measurement means 19. The indicator 5 performs a display action based on the status signal from CPU18.

[0025]The differential amplifier 13 with which the impedance measurement means 19 receives the potential difference signal from the electrodes 9a and 9b for voltage detection, The full wave rectifier 14 and the integration smoothing circuit 15 for carrying out absolute value processing of the sine wave signal from the differential amplifier 13, and making it the absolute value signal which is an analog signal, While incorporating the data of the height from the input and the operation switch 4 from A/D converter 16 which changes an analog signal into a digital signal, and A/D converter 16, weight, age, sex, etc. and calculating body impedance, It comprises CPU18 which calculates the living body's 100 body fat percentage based on the calculated body impedance.

[0026]At this embodiment, if measurement is started, the impedance between the electrode 9a for voltage detection and 9b will be measured 24 times with a predetermined cycle, but the first six batches remove CPU18, it calculates body impedance using the measured value of the 18 remaining batches, and is calculating the body fat percentage based on this.

[0027]CPU18 judges whether each impedance value measured 24 times is unusual. for example, -- if the value of impedance judges whether it is for 200 to 1100 ohms which is a predetermined range and is contained within the limits of this -- normal values -- if not contained, a judgment law is carried out to an abnormal value.

[0028]Next, the display pattern of the indicator 5 is explained using drawing 5. The indicator 5 has the numeric display 51, the graphical representation part 52, and the mark indicating parts 53 and 54. The numeric display 51 comprises four 7 segment display patterns and two decimal point display patterns, and displays the data of test subjects, such as height, weight, and age, the calculated body fat percentage, etc. numerically. The graphical representation part 52 arranges eight dot display patterns to linear shape, is constituted, when it makes it turn on one dot display pattern at a time or displays a body fat percentage during measurement, makes two adjacent dot display patterns turn on, and carries out graphical representation of the corpulence degree. When they display a data type and its unit when the mark indicating parts 53 and 54 input a test subject's data, or they display a body fat percentage, they display "%" which is a unit of a body fat percentage, or display the cell mark the cell voltage which is a power supply indicates it to be to a fall case.

[0029]Next, the measuring operation by the body impedance measuring device of this invention is explained using drawing 1, drawing 3, drawing 6, and drawing 7. S1 to S12 of drawing 1 shows each step of the measuring process.

[0030]First, by S1, if a test subject pushes the electric power switch 4a, CPU18 which detected it will perform processing which turns ON the power supply of the body impedance measuring device 1. Next, a test subject inputs the above-mentioned personal data using the input switch

4b by S2. CPU18 memorizes the personal data inputted according to operation of the input switch 4b. The display example of the indicator 5 at the time of inputting the weight of 62.5 kg is shown in drawing 6 (a).

[0031]Next, a test subject pushes the measuring switch 4c by S3. Then, CPU18 which detected this performs proofreading operation for 4.5 seconds by S4. This proofreading operation is performed in order to proofread the error of the measurement result by temperature characteristics and the voltage characteristic of a measuring circuit. If the accuracy of measurement of a body fat percentage is taken into consideration, this proofreading operation is required about several seconds at least.

[0032]For example, the impedance measurement means 19 is constituted so that a grand level and resistance may switch to known reference resistance and it can connect from the electrodes 9a and 9b for voltage detection by the switch circuit which is not illustrated. And the voltage at the time of connecting a grand level and reference resistance is measured, and the voltage-impedance conversion coefficient is calculated.

[0033]Next, in S5, measurement of body impedance is started following proofreading operation. Measurement of body impedance is measured a total of 24 times a 300msec cycle, and it makes this body impedance in quest of the average value of the measured value of the 18 remaining batches except for the measured value of the impedance of the first six batches so that it may mention later.

[0034]Time after pushing the measuring switch 4c by S3 until measurement is started by S5 is 4.5 seconds, as the display of the indicator 5 is shown in drawing 6 (b), a blink indication only of the bar indicator 52 is given, and others are in a putting-out-lights state. A test subject lays the placing part 2a in 4.5 seconds after pushing the measuring switch 4c by S3 until measuring operation is started, lays a hand in 2b, becomes a measurement posture, and he maintains a posture so that it may not move.

[0035]In S6, the value of the body impedance which CPU18 measured carries out [whether it is within the limits of not less than 200ohms 1100ohms or less which is a prescribed range, and] decision processing. That is, it is judged whether there is any value of the measured impedance within limits detected when the palm touches the current impression electrodes 8a and 8b and the electrodes 9a and 9b for voltage detection. CPU18 judges with the hand not touching each electrode, when the measured value which is not within the limits of this is detected from the value of the measured body impedance.

[0036]And when it is in said within the limits, CPU18 judges that he has no abnormalities S7, processes S8, when there is nothing to said within the limits, judges it as those with abnormalities by S7, and processes S7.

[0037]In S7, an error display as shown in drawing 7 (b) is carried out, and measurement is ended. An error display is displayed as "EE1" by the numeric display 51 of the indicator 5. That

is, CPU18 is operating as a measuring operation control means which stops the measuring operation of impedance, when the measured value which is not contained in the predetermined range is detected, after measurement of said impedance is started.

[0038]In S8, CPU18 judges whether the measurement count amounted to 24 times which is prescribed frequency. If it judges that it does not amount to 24 times in S8, it will return to the measuring process of S5, and S10 will be processed if it judges that it amounted to 24 times. While having repeated the measuring operation of S5 to S8, if one lights up at a time from the dot at the left end of the graphical representation part 52 and the light is switched on to a right end dot with a predetermined cycle, the display action which it turns on one [at a time] from a left end dot again will be repeated. Drawing 6 (c) shows the state where the dot at the left end of the graphical representation part 52 lit up. By S9, among the impedance of 24 batches which CPU18 measured, the first six batches remove, calculate the average value of the impedance of the 18 remaining batches, and make this body impedance.

[0039]Since measuring periods are 300msec, time to measure the impedance of the first six batches is about 1.8 seconds. Even when a test subject becomes a measurement posture just before measurement is started by S5, since the damping time constant is set up be in a stationary state in these 1.8 seconds, the integration smoothing circuit 15 can calculate more exact body impedance.

[0040]CPU18 calculates a test subject's body fat percentage with a predetermined computing equation using the personal data inputted as the body impedance calculated by S9 by S2 by S10. CPU18 displays the body fat percentage for which it asked S10 on the indicator 5 by S11. A body fat percentage carries out graphical representation of the rule of thumb of a corpulence degree in the graphical representation part 52 while displaying it as "23.5%" in the numeric display 51 and the mark indicating part 54, as shown in drawing 7 (a), for example. The character of "becoming thin", a "standard", the "technically overweight", and "obesity" which show a corpulence degree is printed by the upper part of the graphical representation part 52, and it is made to turn on two dots of the graphical representation part 52 under the character which shows the corpulence degree applicable to the calculated body fat percentage, as shown in drawing 7 (a).

[0041]In the flow chart shown in drawing 1, while [4.5 seconds] requiring for the proofreading operation performed by S4 after pushing the measuring switch 4c by S3, he is trying for a test subject to contact a hand to the electrode 3a for left hands, and the electrode 3b for right hands, but he may set this time as 4.5 seconds or more. For example, the waiting time for about 2 seconds may be established between proofreading operation of S4, and the measuring operation of S5, and time may be set up so that a test subject can contact a hand to each electrode with a margin. Time after pushing the measuring switch 4c by S3 until measurement is started by S5 should just be set up more than the time which can contact a

test subject's hand to the electrode 3a for left hands, and the electrode 3b for right hands, after a test subject pushes the measuring switch 4c.

[0042]After the 1st impedance measurement is started by S5 until the 6th impedance measurement is completed, Namely, after an impedance measurement means starts measuring operation, before measurement of the impedance used for the operation of body impedance is started, as shown, for example in drawing 7 (c), "8888" is displayed by the numeric display 51, It may be made to report that measurement used for the operation of body impedance is performed to an operating personnel.

[0043]It detects whether the value of impedance is unusual at S6, and can avoid displaying an inaccurate body fat percentage to a test subject by stopping measurement, in being unusual. Before measurement of the impedance used for the operation of body impedance by judging whether the measured value of the impedance of the first six batches that are not used in particular for the operation of body impedance is unusual starts, it can report to a test subject that a measurement posture is not right.

[0044]Although it has decided by the measurement count whether use for the operation of body impedance among the measured value of impedance in the embodiment shown in drawing 1, it may be made to decide this invention not only by this but by measuring time.

[0045]for example, it may be made to calculate a living body's impedance except for the measured value which the impedance measurement means measured after pushing the measuring switch 4c by S3 of drawing 1 (or -- since measuring operation is started) before carrying out specified time elapse If it explains concretely, after pushing the measuring switch 4c, measurement of impedance will be first started after 4.5 second passage. Measurement of impedance is measured 24 times with the cycle of 300msec after these 4.5 seconds, and total measuring time is 12 seconds.

[0046]CPU18 measures the time after the measuring switch 4c is pushed by S3. And the measured value which is predetermined time and which was measured by the time it carried out 7 second passage calculates the average value of the measured value measured after carrying out 7 second passage, without using for the operation of body impedance, and makes this body impedance.

[0047]Thus, what is necessary is just made to perform the same processing as drawing 1 except deciding whether use for the operation of body impedance by measuring time. For example, as S7 of drawing 1 explained, when the measured value which is not contained in the predetermined range is detected from the measured value of impedance, the measuring operation of impedance is stopped. It is preferred to set up a test subject's predetermined part more than the time when it is possible to make said electrode contact, and time after operating an operation switch until measurement of impedance is started, Before the measured value used for the operation of body impedance is measured, it may be made to perform

predetermined information.
[0048]In the embodiment shown in drawing 1, after the test subject pushed the measuring switch 4c by S3, S4 performed proofreading operation, but this proofreading operation may not necessarily be after pushing the measuring switch 4c. Next, the modification which performs proofreading operation to other timing using drawing 8 is explained.
[0049]drawing 8 -- body impedance -- a measuring device -- a modification -- measuring operation -- being shown -- a flow chart -- it is -- drawing 1 -- differing -- a thing -- proofreading -- processing -- S4 -- ' -- carrying out -- having -- timing -- unusual -- a judging process -- S -- six -- ' -- a measurement count -- a judging process -- S -- eight -- ' -- body impedance -- an operation -- S9 -- ' -- processing -- contents -- it is . Only different processing from drawing 1 is explained and explanation of other processings is omitted.
[0050]First, proofreading operation (S4') is performed in this modification by the next processing in which the test subject pushed the electric power switch 4a by S1. The contents of the proofreading operation by S4' are the same as S4 of drawing 1. In the unusual judging process of S6', the impedance measurement value of the first 15 batches does not judge that it is an abnormal value, and only the impedance measurement value of the 24 remaining batches judges that it is an abnormal value. The impedance measurement time of the first 15 batches is 4.5 seconds, and a test subject lays the placing part 2a in these 4.5 seconds, it lays a hand in 2b, and it becomes a measurement posture.
[0051]In S8', a measurement count judges that it is 39 times which is prescribed frequency, if a measurement count is 39 times, it will progress to S9', and if it is not 39 times, it will return to processing of S5. In S9', among the measured value of 39 batches, the first 21 batches remove, calculate the average value of the value of the impedance of the 18 remaining batches, and make this body impedance.
[0052]In this modification, measurement of impedance is started immediately after operating the measuring switch 4c. However, since measuring periods are 300msec, the time when measurement of the impedance of the first 21 batches removed from the operation of body impedance is performed is 6.3 seconds, For 4.5 seconds of the beginning, it is the time when an operating personnel becomes a measurement posture, and since for the remaining 1.8 seconds comes out time until the integration smoothing circuit 15 will be in a stationary state, the operation of body impedance also with an exact case of this modification is possible for it.
[0053]Thus, while making the measuring operation of the impedance measurement means 19 start immediately after operating the measuring switch 4c, Time for the impedance measurement means 19 to measure the value of the impedance removed from the operation of a living body's impedance (in other words.) Time until measurement of the value of the impedance used for the operation of body impedance after the impedance measurement means 19 starts measuring operation is started, After a test subject operates the measuring

switch 4c, the hand which is a predetermined part may be set up more than the time when it is possible to make the electrodes 3a and 3b contact.

[0054]Although the above is explanation of a modification, as long as the timing of proofreading operation is before measurement of not only the timing shown in drawing 1 or drawing 8 but body impedance, it may be performed to any timing. For example, it may carry out between S2 and S3 of drawing 8, and between S8' and S9'.

[0055]It is not necessary to make measurement of body impedance start immediately after pushing the measuring switch 4c also in the case of the modification of drawing 8. For example, body impedance may be measured, after pushing the measuring switch 4c and waiting for the stability of the circuit of operation amplifier 13 grade for 1 to 2 seconds.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a flow chart which shows the measuring operation of the body impedance measuring device by this invention.
[Drawing 2]It is an appearance perspective view of the body impedance measuring device by this invention.
[Drawing 3]It is a block diagram of the body impedance measuring device by this invention.
[Drawing 4]It is a figure showing the measurement posture at the time of measurement of the body impedance measuring device by this invention.
[Drawing 5]It is a figure showing the display pattern of the indicator of the body impedance measuring device by this invention.
[Drawing 6]It is a display example of the body impedance measuring device by this invention.
[Drawing 7]It is a display example of the body impedance measuring device by this invention.
[Drawing 8]It is a flow chart which shows the measuring operation of the modification of the body impedance measuring device of this invention.
[Description of Notations]
1 Body impedance measuring device
2a and 2b Placing part
3a and 3b The electrode for left hands, electrode for right hands
4 Operation switch
4a Electric power switch
4b Input switch
4c Measuring switch
5 Indicator
6a and 6b Lateral portion
7a and 7b Projection

8a and 8b Electrode for current impression
9a and 9b Electrode for voltage detection
10 Body part
11a and 11b Crevice
12 High frequency signal generating part
13 Differential amplifier
14 Full wave rectifier
15 Integration smoothing circuit
16 A/D converter
17 ROM
18 CPU
19 Impedance measurement means
100 Body impedance

[Translation done.]

* NOTICES *

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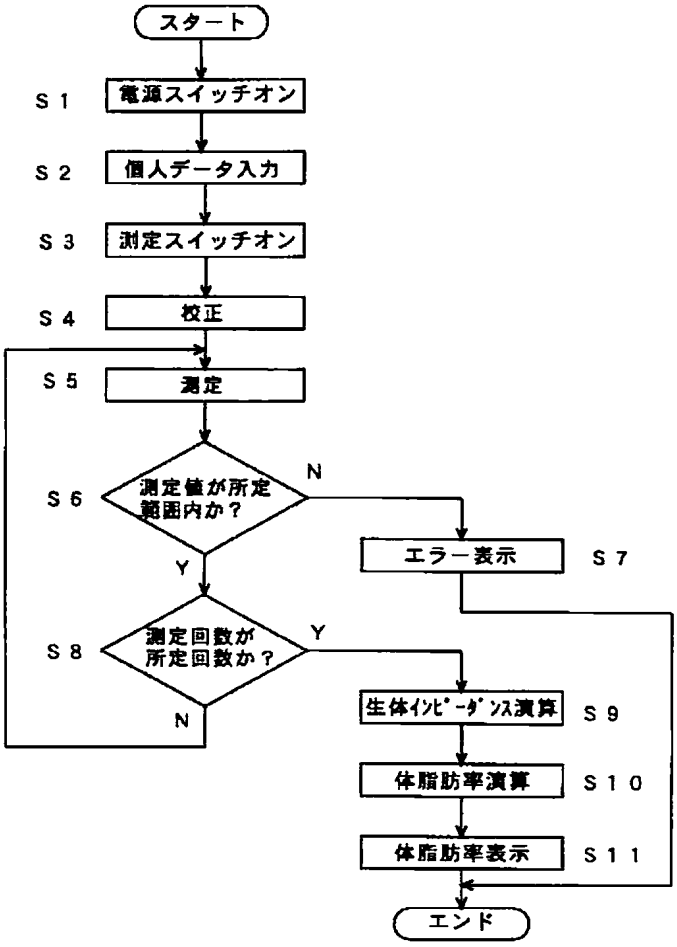
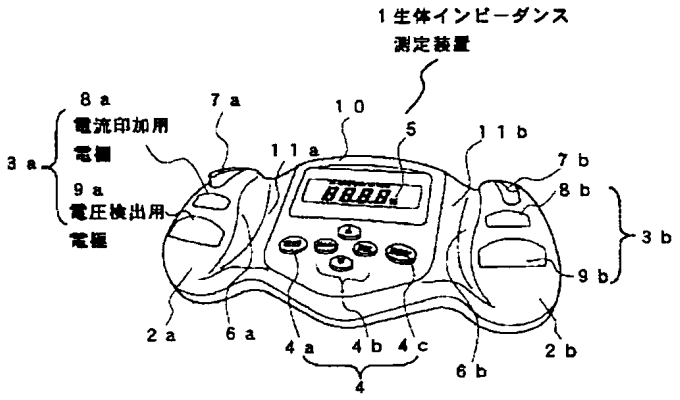
DRAWINGS

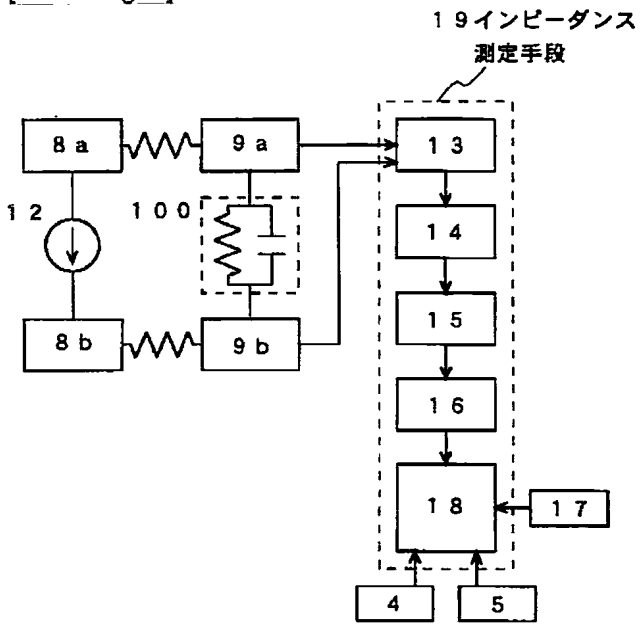
[Drawing 1]



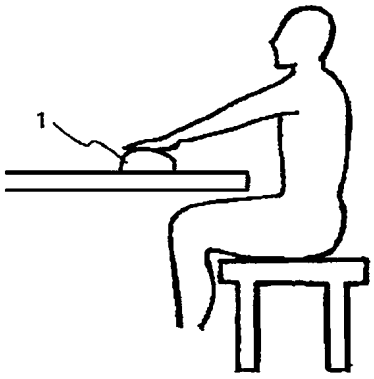
[Drawing 2]



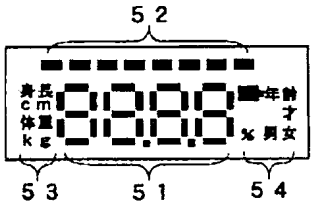
[Drawing 3]



[Drawing 4]



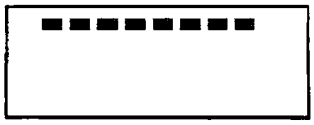
[Drawing 5]



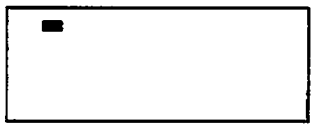
[Drawing 6]

(a)

(b)

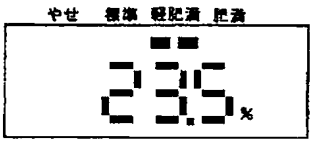


(c)



[Drawing 7]

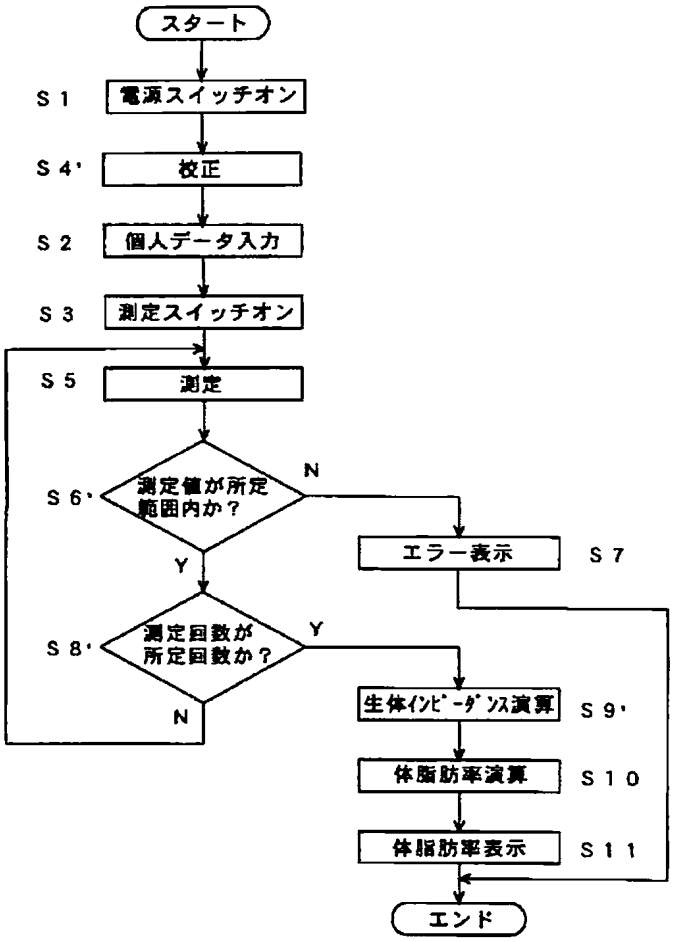
(a)



(b)

(c)

[Drawing 8]



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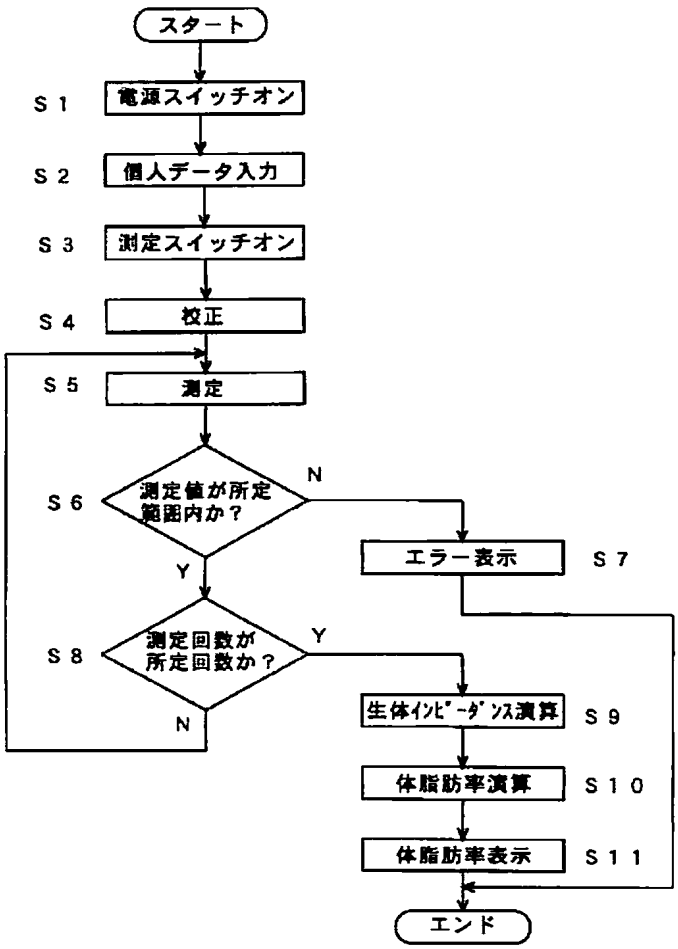
スタート
S 1
電源スイッチオン
S 2
個人データ入力
S 3
測定スイッチオン
S 4
校正
S 5
測定
S 6
測定値が所定範囲内か？
N
エラー表示
S 7
Y
S 8
測定回数が所定回数か？
Y
N
生体インピーダンス演算
S 9
体脂肪率演算
S 1 0
体脂肪率表示
S 1 1
エンド